FINAL REPORT

PROJECT: CSIRO AAHTS 2018.02

AWARD RECIPIENT: Dr Zoe Spiers, Dr Jeffrey Go

ADDRESS: Elizabeth Macarthur Agricultural Institute, Woodbridge Road, Menangle NSW
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DATE: 28 January 2019

ACTIVITY UNDERTAKEN
The project was the delivery of an intensive pathology training workshop for laboratory veterinarians in New South Wales by the acknowledged world leaders in aquatic diagnostics, Drs John Brian Jones and Judith Handlinger.

OUTCOMES ACHIEVED TO DATE

1. Training of veterinarians and pathologists, by upskilling pathology knowledge of aquatic animals in order to improve diagnostic capacity
2. A copy of workshop slides, digitised with a slide scanner, are available at EMAI to provide a training resource for future pathologists, subject to agreed copyright conditions. This resource will be available to provide ongoing training opportunity for private study by pathologists, based on pre-workshop agreements put in place with the consultants.

Acknowledgements
The authors acknowledge the generous contribution of the FRDC Aquatic Animal Health Training Scheme and the NSW Department of Primary Industries (NSW DPI), Elizabeth Macarthur Agricultural Institute (EMAI) for allowing this important training to proceed. The authors would also like to thank Drs Judith Handlinger and J. Brian Jones for their expertise and time.

Background
In 2017, 6 veterinary pathologists and veterinary pathology residents have joined the NSW DPI EMAI laboratory, but came with minimal previous exposure to aquatic animal pathology. Since the majority of Australia and New Zealand's senior fish pathologists have entered, or are nearing, retirement, it is essential that opportunities are utilized to impart their knowledge and experience onto early to middle career veterinary pathologists.

Dr John Brian Jones is an adjunct Professor with the School of Veterinary and Life Sciences, Murdoch University. John (called Brian) is a fish pathologist specializing in molluscs but with extensive experience in fish and crustaceans as well. He was the Western Australian Senior, later Principal Fish Pathologist from 1995 to 2013, and Principal Advisor on Aquatic Animal Health at the New Zealand Ministry for Primary Industries from 2013 to 2018. He was also a NACA/FAO regional resource expert on mollusc diseases during this period, and has

published over 180 papers mainly on fish and shellfish diseases. He retired from the Ministry for Primary Industries in New Zealand in January 2018 after a period seconded to the Australian Inspector General of Biosecurity in 2017.

Dr Judith Handlinger is an Adjunct Researcher with the University of Tasmania, and former Senior Veterinary Pathologist (Aquatic Animals) with Tasmanian Department of Primary Industries, Parks, Water & Environment, with diagnostic and research experience in diseases and disease control in finfish, oysters, abalone and rock lobsters. She has been officially recognised as regional resource expert in mollusc health for the Asia-Pacific region, and an invited trainer for local & international short courses in aquatic animal health including the 2014 Pathology Roadshow for the Australian Animal Pathology Standards Program, and preparation of web-based training resources in fish pathology for the same program.

Need

In 2017 and 2018, 3 new veterinary pathologists and 3 veterinary pathology residents have joined the NSW EMAI Pathology Services, but came with minimal previous exposure to aquatic animal pathology; concurrently, NSW DPI experienced a loss of a number of more experienced pathology staff who had previous interest and/or exposure to aquatic animal pathology. Similar staff turnover of pathologists experienced in aquatic pathology has also occurred in Sydney University and Taronga Zoo. The Elizabeth Macarthur Agricultural Institute is New South Wales' only government veterinary laboratory, and is the recipient of routine submissions for notifiable diseases and general diagnostic investigations for disease events in farmed, wild-caught, recreational and ornamental aquatic animals. Competency of the veterinary pathologists in recognizing and identifying disease agents is essential in maintaining Australia's biosecurity and market access. An intensive training workshop raises the level of aquatic pathology capability and improves national capacity for aquatic animal disease surveillance and diagnosis, thereby making the State better equipped to meet the current and future needs of the aquatic industry and wider society.

Objectives

1. The project facilitated the opportunity for intensive training of staff with minimal previous exposure to aquatic animal pathology, including veterinarians, new pathologists and pathology residents in animal pathology.

The workshop was attended by three veterinary pathology residents, a fish health scientist, a veterinarian and a veterinary virologist.

2. Facilitated an update and in-depth training for existing veterinarians and veterinary pathologists in NSW with some degree of previous exposure to aquatic animal pathology

The workshop was also attended by five qualified veterinary pathologists, each with varying confidence and experience in aquatic animal pathology. The aim was to improve their capability in this area.

3. The utilisation of the immense knowledge and experience of recently retired Dr John Brian Jones and Dr Judith Handlinger

Drs Handlinger and Jones provided a mix of formal presentations, small group slide

discussions and practical workshops to allow multiple avenues of learning and information transfer.

4. Actively responded to industry concerns regarding the future proofing of aquatic animal disease diagnosis expertise in NSW.

This objective was achieved by providing a learning opportunity for veterinarians and veterinary pathologists from not only government, but universities and private practice.

Methods

The project was the delivery of an intensive 5 day workshop, presented by Drs Judith Handlinger and J. Brian Jones at EMAI. One session was also presented by Dr Jeffrey Go covering biosecurity information for attendees. A timetable of the workshop is provided in Appendices.

Results/ Discussion

The workshop has improved professional familiarity with aquatic animal pathology and therefore by extension enhanced the diagnostic capacity at EMAI and more broadly, at those major facilities within NSW that are likely to receive aquatic disease diagnostic samples, to address emerging and emergency aquatic animal diseases. This will improve the capacity for early detection to facilitate rapid emergency response, which is essential to safeguard access to international markets and maintain trade. As well improved ability for early detection of disease issues that impact production has been achieved which is of direct relevance to aquaculture producers.

The workshop was generally well received by attendees. A feedback survey was emailed to all enrolled delegates. Refer to Appendices for full survey results. 60% of survey respondents strongly agreed to the statement “the information presented in the workshop was at a level you understood”, with 100% believing the “information and skills presented were relevant and useful”. All survey respondents would recommend a colleague to attend if the workshop was repeated.

Figure 1: The attendees listen to Dr. J. Brian Jones present a seminar

Figure 2: The workshop attendees observe Drs Handlinger and Jones in the post mortem room at Elizabeth Macarthur Agricultural Institute

Figure 3: Presenters and attendees at the Aquatic Animal Pathology Workshop, NSW 2019

Benefits and Adoption

The number of aquatic diagnostic submissions in NSW has increased over recent years, particularly with an increasing awareness of biosecurity, although submission numbers are tightly responsive to disease events in this sector. With an aging population of pathologists in general in Australia, and a spate of retiring senior fish pathologists, it is essential for projects such as this to facilitate and maintain aquatic capabilities of early- to mid-career veterinary pathologists to enable future proofing and maintenance of biosecurity preparedness for Australian aquatic industries and the environment.

Within NSW, there is an increasing need for expertise in aquatic pathology, particularly given anticipated major growth of yellowtail kingfish sea-cage culture: an area of growing interest and importance in several other jurisdictions (including South Australia and Western Australia), as well as significant growth in other finfish sectors in NSW such as Murray Cod aquaculture. Increased biosecurity preparedness through improved expertise in general aquatic animal pathology, and a better understanding of kingfish pathogens and pathology will therefore be of increasing national relevance.

Expertise in crustacean pathology was recently brought into the limelight by the White Spot Syndrome Virus (WSSV) disease event in Queensland, and there are a number of emerging diseases in penaeid prawn culture in South East Asia, e.g. Enterocytozoon hepatopenaei (EHP), for which pathology is a front line diagnostic tool, and for which routine molecular diagnostics are not yet established in Australia. During the workshop, Dr Jones led small group histopathology sessions on crustacean pathology, and provided more formal large group presentations to transfer some of his expansive knowledge to attendees.

Expertise in molluscan pathology is of particular importance in NSW due to the thriving oyster industry, and past disease events that are of national and international concern, e.g. QX (*Marteilia sydneyi*) of Sydney Rock Oysters, and Pacific Oyster Mortality Syndrome (Ostreid herpesvirus-1) of Pacific Oysters. Interest in other new species of molluscs for culture, such as blue mussels, will also require development of appropriate pathology expertise to meet the biosecurity and health management needs for these developing industries. During the workshop, Dr Handlinger presented sessions on mollusc pathology and also led small group fish and molluscan histopathology sessions. Dr Handlinger's presentations are available online through the Australian Animal Pathology Standards Program (AAPSP) Systemic Fish Pathology.

Further Development

The workshop provided a rare opportunity to expose veterinarians and veterinary pathologists to world renowned aquatic animal pathologists at a convenient location within New South Wales. All participants who responded to the feedback survey indicated a willingness to recommend a colleague should the workshop ever be offered again, indicating some potential for further workshops to be delivered in a similar format. It is with great regret that the authors acknowledge that the expertise of Drs Handlinger and Jones may not be available in person in the longer term, so any opportunity to impart some of the expertise accumulated from their long, distinguished careers in the field should be utilised now as a priority.

Intellectual Property

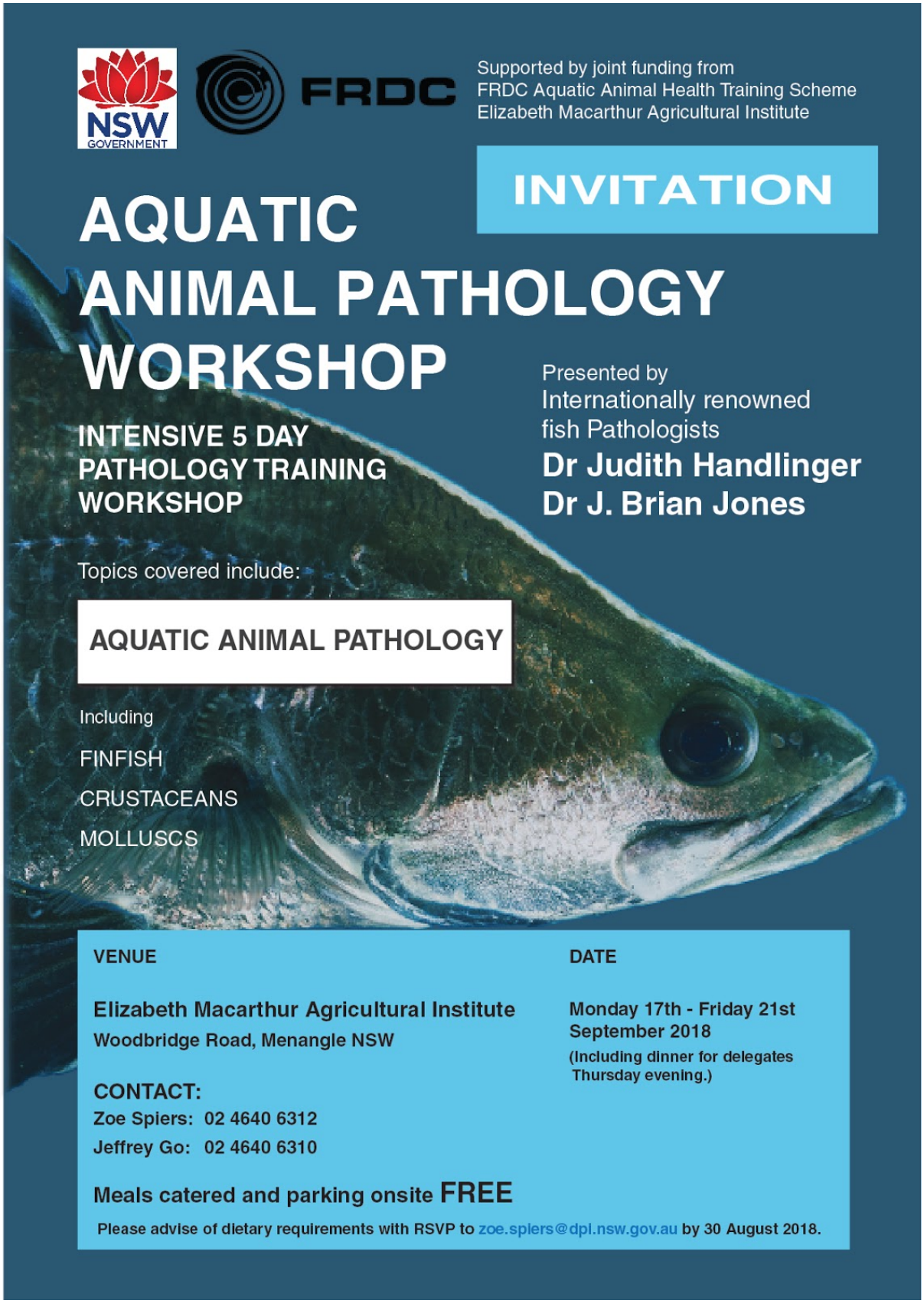
A collection of scanned images depicting histology slides was accumulated during the course. These are available at EMAI as a training resource for pathologists, for private study as per pre-workshop agreements with the consultants. Presentations originally prepared by Dr Judith Handlinger and presented at the workshop are available online through the Australian Animal Pathology Standards Program (AAPSP) http://aapspextranet.animalhealthaustralia.com.au/professional-development/online-presentations/systematic-fish-pathology/. The contact for further information or to subscribe to the

Australian Animal Pathology Standards Program is AAPSPAdmin@animalhealthaustralia.com.au.

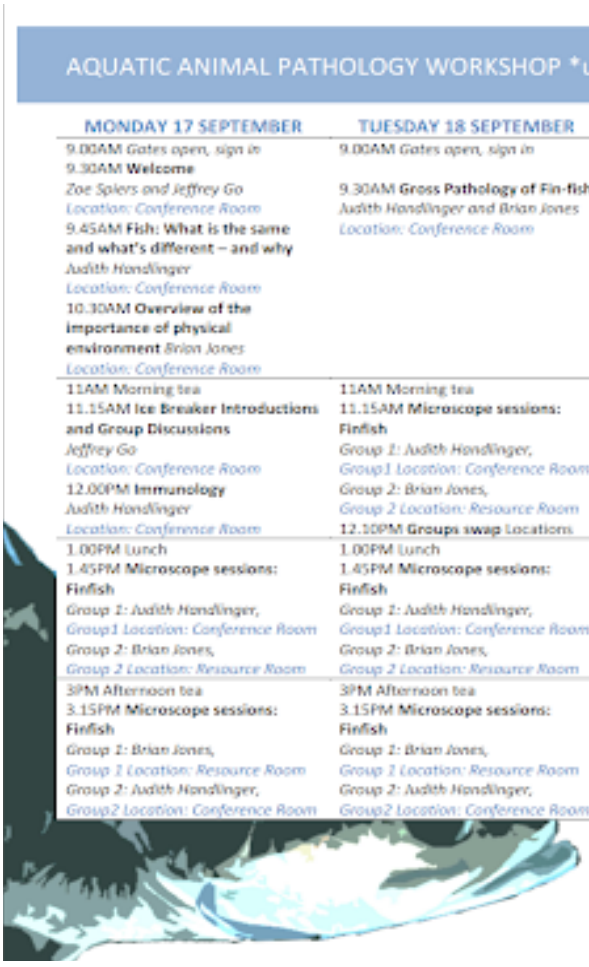
Appendices

1. Aquatic Animal Pathology Workshop Invitation
2. Aquatic Animal Pathology Workshop Timetable
3. List of Attendees
4. Individual responses to Feedback Survey

Appendix 1: Aquatic Animal Pathology Workshop Invitation



Appendix 2: Aquatic Animal Pathology Workshop Timetable



AQUATIC ANIMAL PATHOLOGY WORKSHOP *updated — EMAI NSW, 17-21 SEPTEMBER 2018

MONDAY 17 SEPTEMBER	TUESDAY 18 SEPTEMBER	WEDNESDAY 19 SEPTEMBER	THURSDAY 20 SEPTEMBER	FRIDAY 21 SEPTEMBER
9.00AM *Gates open, sign in* 9.30AM **Welcome** *Zoe Spiers and Jeffrey Go* *Location: Conference Room* 9.45AM **Fish: What is the same and what's different – and why** *Judith Handlinger* *Location: Conference Room* 10.30AM **Overview of the importance of physical environment** *Brian Jones* *Location: Conference Room*	9.00AM *Gates open, sign in* 9.30AM **Gross Pathology of Fin-fish** *Judith Handlinger and Brian Jones* *Location: Conference Room*	9.00AM *Gates open, sign in* 9.30AM **Clinical Pathology of Fin-fish** **Basics and modifying factors of invertebrate responses – General, Molluscs** *Judith Handlinger* 10.30AM **Basics and modifying factors of invertebrate responses - Crustaceans** *Brian Jones* *Location: Conference Room*	9.00AM *Gates open, sign in* 9.30AM **Microscope sessions: Crustaceans and Molluscs** *Group 1: Judith Handlinger,* *Group 1 Location: Resource Room* *Group 2: Brian Jones,* *Group2 Location: Conference Room*	9.00AM *Gates open, sign in* 9.30AM **Coffee and tea** *Location: Conference Room* 9.40AM **Mollusc and Crustacean Case discussions, including participant cases*** *Judith Handlinger* *Location: Conference Room*
11AM Morning tea 11.15AM **Ice Breaker Introductions and Group Discussions** *Jeffrey Go* *Location: Conference Room* 12.00PM **Immunology** *Judith Handlinger* *Location: Conference Room*	11AM Morning tea 11.15AM **Microscope sessions: Finfish** *Group 1: Judith Handlinger,* *Group1 Location: Conference Room* *Group 2: Brian Jones,* *Group 2 Location: Resource Room* 12.10PM **Groups swap** Locations	11AM Morning tea 11.15AM **Finfish Case discussions, including participant cases*** *Judith Handlinger and Brian Jones* *Location: Conference Room*	11AM Morning tea 11.15AM **Microscope sessions: Crustaceans and Molluscs** *Group 1: Brian Jones,* *Group1 Location: Conference Room* *Group 2: Judith Handlinger,* *Group 2 Location: Resource Room*	11AM Morning tea 11.15AM **Microscope sessions: Crustaceans and Molluscs** *Group 1: Brian Jones,* *Group1 Location: Conference Room* *Group 2: Judith Handlinger,* *Group2 Location: Resource Room*
1.00PM Lunch 1.45PM **Microscope sessions: Finfish** *Group 1: Judith Handlinger,* *Group1 Location: Conference Room* *Group 2: Brian Jones,* *Group 2 Location: Resource Room*	1.00PM Lunch 1.45PM **Microscope sessions: Finfish** *Group 1: Judith Handlinger,* *Group1 Location: Conference Room* *Group 2: Brian Jones,* *Group 2 Location: Resource Room*	1.00PM Lunch 1.45PM **Microscope sessions: Finfish** *Group 1: Brian Jones,* *Group 1 Location: Resource Room* *Group 2: Judith Handlinger,* *Group2 Location: Conference Room*	1.00PM Lunch 1.45PM **Gross Pathology and Clinical Pathology Sampling Workshop** *Judith Handlinger and Brian Jones* *Location: Post Mortem Room*	1.00PM Lunch 1.45PM **Microscope sessions: Crustaceans and Molluscs** *Location: Conference Room* *Judith Handlinger*
3PM Afternoon tea 3.15PM **Microscope sessions: Finfish** *Group 1: Brian Jones,* *Group 1 Location: Resource Room* *Group 2: Judith Handlinger,* *Group2 Location: Conference Room*	3PM Afternoon tea 3.15PM **Microscope sessions: Finfish** *Group 1: Brian Jones,* *Group 1 Location: Resource Room* *Group 2: Judith Handlinger,* *Group2 Location: Conference Room*	3PM Afternoon tea 3.15PM **Microscope sessions: Finfish** *Group 1: Judith Handlinger,* *Group1 Location: Conference Room* *Group 2: Brian Jones,* *Group 2 Location: Resource Room*	3PM Afternoon tea 3.15PM **Gross Pathology and Clinical Pathology Sampling Workshop** continued** *Judith Handlinger and Brian Jones* *Location: Post Mortem Room*	3PM Afternoon tea 3.15PM **Microscope sessions: Crustaceans and Molluscs** *Location: Conference Room* *Judith Handlinger* **4.30PM Finish**

Dinner, Campbelltown**

Supported by joint funding from FRDC Aquatic Animal Health Training Scheme and Elizabeth Macarthur Agricultural Institute

* Bring your own cases for discussion

** Workshop dinner will be at 6.30pm in Campbelltown, Thursday. Further information will be provided during the workshop

Appendix 3: List of Attendees

1. Marina Gimeno, veterinary pathologist, Sydney University
2. Shannon Donahoe, veterinary pathologist, Sydney University
3. Laura Setyo, resident in veterinary anatomical pathology, Sydney University
4. Anne Jordan, veterinary pathologist, Sydney University
5. Sarah Gestier, veterinary virologist, EMAI
6. Tom Westermann, resident in veterinary anatomical pathology, EMAI
7. Pedro Pinczowski, veterinary pathologist, EMAI
8. Leah Johnson, veterinary pathologist, EMAI
9. Keith Walker, team leader veterinary pathology, EMAI
10. Cahya Fusianto, fish health scientist from Indonesia, Sydney University
11. Erandi Pathirana, veterinarian, lecturer in fish pathology, Sydney University
12. Jeffrey Go, organiser
13. Zoe Spiers, organiser
14. Judith Handlinger, presenter
15. Brian Jones, presenter

Appendix 4: Individual responses to Feedback Survey, imported from Surveymonkey.com

Collector: Web Link 1 (Web Link)
Started: Tuesday, November 06, 2018 12:15:36 PM
Last Modified: Tuesday, November 06, 2018 12:20:53 PM
Time Spent: 00:05:16
IP Address: 129.78.56.166

Q1
The workshop location was convenient
Agree
Please comment why:
A place with more public transportation options will be better.
Q2
The facilities at EMAI were adequate for the workshop
The conference room facilities were adequate
The post mortem room facilities were adequate
The microscope room facilities were adequate
Q3
Were you satisfied or dissatisfied with EMAI's catered meals?
Satisfied
Q4
How clear were the objectives of this workshop?
Very clear
Q5
How much of the information presented at this workshop was new to you?
Most of it
Q6
The information presented in the workshop was at a level you understood
Agree
Q7
The information and skills presented were relevant and useful
Strongly agree
Q8
The materials provided were useful
Agree
Q9
If this workshop was repeated, I would recommend a colleague to attend
Strongly agree
Q10
Any comments on the workshop?
All was good!

Collector: Web Link 1 (Web Link)
Started: Monday, November 05, 2018 8:48:08 AM

Last Modified: Monday, November 05, 2018 8:56:34 AM
Time Spent: 00:08:26
IP Address: 52.64.219.10

Q1
The workshop location was convenient
Strongly agree
Please comment why:
It was at my place of work :)
Q2
The facilities at EMAI were adequate for the workshop
The conference room facilities were adequate
The post mortem room facilities were adequate
The microscope room facilities were adequate
Q3
Were you satisfied or dissatisfied with EMAI's catered meals?
Satisfied
Comments:
The catering is above average
Q4
How clear were the objectives of this workshop?
Very clear
Q5
How much of the information presented at this workshop was new to you?
Most of it
Q6
The information presented in the workshop was at a level you understood
Strongly agree
Q7
The information and skills presented were relevant and useful
Strongly agree
Q8
The materials provided were useful
Strongly agree
Q9
If this workshop was repeated, I would recommend a colleague to attend
Strongly agree
Q10
Any comments on the workshop?
Microscope work was very
useful and good to have the two contrasting styles of the presenters when hosting microscope rounds. Perhaps a slide-based tour of basic histology of a range of aquatic species could be good (this happened anyway but maybe have it as a specific session). Define learning objectives for the course eg basic aquatic histology, basic histo lesions that each species throws up, biggest artefactual changes to watch for, top 5 common/most relevant diseases of each species and top 1-2 exotic diseases to watch for

Collector: Web Link 1 (Web Link)
Started: Friday, November 02, 2018 7:32:52 AM
Last Modified: Friday, November 02, 2018 7:33:52 AM
Time Spent: 00:01:00
IP Address: 130.91.89.81

Q1
The workshop location was convenient
Strongly agree
Please comment why:
I work at EMAI ;)
Q2
The facilities at EMAI were adequate for the workshop
The conference room facilities were adequate
The post mortem room facilities were adequate
The microscope room facilities were adequate
Q3
Were you satisfied or dissatisfied with EMAI's catered meals?
Very satisfied
Comments:
Really really good
Q4
How clear were the objectives of this workshop?
Very clear
Q5
How much of the information presented at this workshop was new to you?
Most of it
Q6
The information presented in the workshop was at a level you understood
Agree
Q7
The information and skills presented were relevant and useful
Strongly agree
Q8
The materials provided were useful
Strongly agree
Q9
If this workshop was repeated, I would recommend a colleague to attend
Strongly agree
Q10
Any comments on the workshop?
Respondent skipped this question

Collector: Web Link 1 (Web Link)
Started: Friday, November 02, 2018 7:32:52 AM
Last Modified: Friday, November 02, 2018 7:33:52 AM
Time Spent: 00:01:00

IP Address: 130.91.89.81

Q1
The workshop location was convenient
Strongly agree
Please comment why:
I work at EMAI ;)
Q2
The facilities at EMAI were adequate for the workshop
The conference room facilities were adequate
The post mortem room facilities were adequate
The microscope room facilities were adequate
Q3
Were you satisfied or dissatisfied with EMAI's catered meals?
Very satisfied
Comments:
Really really good
Q4
How clear were the objectives of this workshop?
Very clear
Q5
How much of the information presented at this workshop was new to you?
Most of it
Q6
The information presented in the workshop was at a level you understood
Agree
Q7
The information and skills presented were relevant and useful
Strongly agree
Q8
The materials provided were useful
Strongly agree
Q9
If this workshop was repeated, I would recommend a colleague to attend
Strongly agree
Q10
Any comments on the workshop?
Respondent skipped this question

Collector: Web Link 1 (Web Link)
Started: Thursday, November 01, 2018 5:15:34 PM
Last Modified: Thursday, November 01, 2018 5:24:06 PM
Time Spent: 00:08:31
IP Address: 129.78.56.161

Q1
The workshop location was convenient

Disagree
Please comment why:
Although it was convenient to me personally I feel like the majority of the participants would have found it convenient if it was held close to town.
Q2
The facilities at EMAI were adequate for the workshop
The conference room facilities were adequate
The post mortem room facilities were adequate
The microscope room facilities were adequate
Q3
Were you satisfied or dissatisfied with EMAI's catered meals?
Satisfied
Q4
How clear were the objectives of this workshop?
Extremely clear
Q5
How much of the information presented at this workshop was new to you?
About half of it
Q6
The information presented in the workshop was at a level you understood
Strongly agree
Q7
The information and skills presented were relevant and useful
Strongly agree
Q8
The materials provided were useful
Strongly agree
Q9
If this workshop was repeated, I would recommend a colleague to attend
Strongly agree
Q10
Any comments on the workshop?
Respondent skipped this question

Collector: Web Link 1 (Web Link)
Started: Thursday, November 01, 2018 12:04:05 PM
Last Modified: Thursday, November 01, 2018 12:12:35 PM
Time Spent: 00:08:29
IP Address: 103.224.120.74
Page 1
Q1
The workshop location was convenient
Strongly agree
Q2
The facilities at EMAI were adequate for the workshop
The conference room facilities were adequate
Q3

Were you satisfied or dissatisfied with EMAI's catered meals?

Very satisfied

Q4

How clear were the objectives of this workshop?

Extremely clear

Q5

How much of the information presented at this workshop was new to you?

Some of it

Q6

The information presented in the workshop was at a level you understood

Strongly agree

Q7

The information and skills presented were relevant and useful

Strongly agree

Q8

The materials provided were useful

Strongly agree

Q9

If this workshop was repeated, I would recommend a colleague to attend

Strongly agree

Q10

Any comments on the workshop?

It was great and very useful